# Noteworthy anatomical and physiological researches.

## Gases in massive organs[1].

While this paper does not contribute very much that is new it is interesting as a careful record of experiment and as a verification of earlier researches. The author has availed himself of the more recent method of gas-analysis and brings out some interesting points, particularly regarding the pressure of internal atmospheres in plant-organs. In general his method is to produce an artificial chamber by perforating the fruit or tuber or root to be observed and in the *lacuna artificielle* thus produced to insert a tube, with the lower end sunk in a mercury-bath from the upper portion of which tube, as needed, a little gas can be taken for analysis. In this way it is possible to have under one's eye the changes that may take place and the differences, if any exist, between the internal and the external air are clearly distinguished. Potato-tubers and several fleshy fruits, those of various gourds and Rosaceæ, were studied with much care and an effort was made to discover not only the nature and pressure of the inclosed gases but to determine in what way these gases were distributed through the tissues, whether by diffusion, effusion (the movement through small channels) or by dialysis through membranes. Some of the general conclusions may be briefly transcribed here to indicate better the scope and extent of the researches.

1. The internal atmosphere of fleshy or massive organs is generally marked by a notable increase over the surrounding air in the proportion of oxygen, a feeble proportion of $CO_2$ and a slightly different proportion of nitrogen, which sometimes exceeds that in the outer air and sometimes does not, but is always rather close and slow to vary. 2. The internal pressure is almost always different from that of the outer air. Sometimes it is negative and sometimes positive but always in inverse proportion to the nitrogen. 3. The oxygen tends to be distributed through pores (effusion), but the $CO_2$ tends to be distributed through membranes (dialysis). 4. Humidity acts upon a massive organ in such a way as to increase its permeability while diminishing its porosity, and this is reflected in the changes in the pressure and composition of the internal gases. It tends therefore to a purifying of the air, in most cases, by the accumulation of oxygen and the throw-

[1] H. Devaux :— Ann. Sci. Nat. Botan., Ser. VII, xiv, 297–395.

ing off of $CO_2$. 5. Dessication acts in the reverse manner and, by diminishing the permeability, decreases the oxygen and tends to the storing up of a greater proportion of $CO_2$. 6. The nitrogen is passive and is carried as a by-product with the others. 7. The general conditions of gaseous interchange between fleshy plant structures and the rest of the plant or the outer air are best understood when we fix our attention upon the undoubted fact that there are three different kinds of interchange going on simultaneously, each of which is capable of modification by external or internal conditions. These are diffusion, effusion and dialysis.—CONWAY MACMILLAN.

## Effects of electricity on growth.[1]

In this paper Hegler has described the effects of electricity on the growth of plants. In it he has shown that certain plants respond to electrical stimuli in a similar manner as they do to light. In his experiments he used an apparatus like that used by Hertz. Hertz has already demonstrated that electricity presents quite the same phenomena as light; that the electric beam can be polarized, focused, reflected and refracted.

The apparatus consists briefly of four Bunsen elements, which are connected by an interrupter with a very large induction apparatus, consisting of many thousand feet of coil; from this the current is transmitted to two brass knobs of 1.5 cm. radii, which constitute the poles, and between which the electric spark is made to pass at regular intervals. The brass knobs are placed about 10 cm. apart in a vertical direction, so that the transverse electrical waves fall on the long axis of the plant which is situated 1–2 cm. from the electric spark.

For these experiments Hegler found the rapidly growing aerial hyphæ of *Phycomyces nitens* particularly well adapted, as it is well known that they are exceedingly sensitive to all external influences. The plants were cultivated on sterilized bread and covered with a black paper cylinder to prevent heliotropic bendings. He found in from 3 to 6 hours the hyphæ bend away from the electric source, from which he maintains they are negatively electrotropic. The angle of bending, however, he found somewhat smaller than that produced by intense light. Herr Hegler also experimented with reflected rays, both from a plain and parabolic metal reflector, from which he obtained similar results.

[1] ROBERT HEGLER:—Ueber die physiologische Wirkung der Hertz'schen Electricitætszellen auf Pflanzen. Leipzig.